

## NATURAL RESOURCES CONSERVATION SERVICE CONSERVATION PRACTICE STANDARD

### SINKHOLE AND SINKHOLE AREA TREATMENT

(No.)

#### CODE 527

#### DEFINITION

The treatment of sinkholes and/or sinkhole areas to reduce contamination of groundwater resources and/or improve farm safety.

surface water and the karst features will be conducted by a qualified geologist.

Trash and other material will be removed from the sinkhole and disposed of in an environmentally sound manner.

#### PURPOSE

This practice may be applied as part of a conservation management system to support one or more of the following purposes:

- To improve water quality.
- To improve farm safety.

Excess surface water caused by construction activities will be diverted from the sinkhole area in accordance with the Conservation Practice Standard Diversion (Code 362).

Nutrient and pest management plans will be developed for the drainage area of the sinkhole controlled by the landowner.

#### Vegetative Treatment

All sinkholes treated will have a vegetated buffer a minimum of 25 feet wide measured from the rim of the sinkhole. The buffer area may be extended to control concentrated flow channels entering the sinkhole. Guidance for vegetative buffers for the treatment of sinkhole areas is addressed in Riparian Forest Buffer (Code 391), Riparian Herbaceous Cover (Code 390), and Filter Strip (Code 393). The width of the vegetated buffer will be established and maintained in accordance with the type of buffer chosen. The sinkhole and surrounding buffer will be fenced in accordance with Conservation Practice Standard Fence (Code 382).

#### CONDITIONS WHERE PRACTICE APPLIES

This practice applies on any land surface or existing practice where the soils and geologic conditions have led to the development of sinkholes.

#### CRITERIA

##### General Criteria Applicable to all Purposes

The installation and operation of sinkhole treatment(s) will comply with all federal, state, and local laws, rules, and regulations.

A geologic investigation of the potential impact of the treatment on ground and

Livestock will be excluded from the vegetative buffer except where applicable for maintenance purposes.

Nutrients, herbicides, pesticides, and animal waste will not be applied within an established buffer. Only mechanical treatments shall be used for weed control.

Appropriate erosion and sediment control measures will be used to reduce the amount of sediment entering sinkhole openings during the establishment of the vegetative buffer.

### **Surface Water Control**

Changes to the volume of surface water that enters a sinkhole may disturb the underground hydrology. To the extent possible, the surface water flow should be maintained at historic (or predevelopment) volumes. No additional runoff will be added to the sinkhole drainage area.

Pre-existing concentrated flow channels will be stabilized but should not otherwise be altered. If a plug or inverted filter is used, the area to be protected will be characterized by a qualified geologist. Concentrated flow caused by the construction activities will be dispersed with a suitable spreading structure.

### **Sinkhole Treatment/Closing**

Adequate protection of most sinkhole and sinkhole areas can be achieved by the use of vegetative buffers and livestock exclusion. However, if an open sinkhole is a safety hazard, it may be treated with a rock filter, gabions, or other methods approved by the State Conservation Engineer.

Sinkholes that open into caves shall not be filled under any circumstances. Gated openings may be used for safety reasons.

## **CONSIDERATIONS**

The practice should work in conjunction with conservation cropping systems, pest and nutrient management, and practices that control sheet, rill, and gully erosion.

Current and planned land use should be considered. In particular, structures, septic fields, wells, feedlots, ponds, and animal waste storage systems should not be located over a sinkhole site or within the impact area.

For a sinkhole receiving contaminated overland flow, every effort should be made to first treat the source of the contamination. Although it is important to maintain the hydrology of the karst system, it may be more beneficial to the ground water quality to divert the contaminated water away from the sinkhole. In some cases, it may be necessary to completely plug a sinkhole with sealing materials rather than treat it with a filter. Acceptable sealing materials are provided in ASTM D 5299, part 6.4. An example of this would be a sinkhole in a feedlot or a site that is difficult to protect by any other method.

The sinkhole treatment should not result in excessive surface water ponding or high soil moisture conditions over an extended period of time.

Treatment of one sinkhole may have an effect on other sinkholes or solution features in the vicinity.

The use of a conservation easement for the buffer and sinkhole should be considered.

If the sinkhole throat or bedrock fracture cannot be observed, consider using one-foot

diameter stone as the base layer for the inverted filter design.

## PLANS AND SPECIFICATIONS

Plans and specifications for Sinkhole and Sinkhole Area Treatment will be in keeping with this standard and will describe the requirements for applying the practice to achieve its intended purpose.

1. Plan view showing sinkhole and sinkhole area. Include topographic information and photographs.
2. The geologic investigation will include a study of potential impacts on the Karst resource.
3. Planned treatment measures.
4. Delineate the drainage area of sinkhole on a topographic map.
5. Availability of safe outlet for surface water, if applicable.
6. Operation and maintenance requirements.
7. Special safety requirements.
8. Environmental Assessment.

## OPERATION AND MAINTENANCE

An operation and maintenance (O&M) plan will provide specific instructions for maintaining the sinkhole and sinkhole area

treatment, including reference to periodic inspections and the prompt repair and/or replacement of damaged components.

## REFERENCES

1. Koerner, R. M. *Designing with Geosynthetics*. Prentice-Hall, Englewood Cliffs, NJ. 1985.
2. National Crushed Stone Association. *Graded Riprap Stone, Quarried Stone for Erosion and Sediment Control*. June 1978.
3. White, W. B. *Geomorphology and Hydrology of Karst Terrains*. Oxford University Press, Inc., New York, New York. 1988.
4. USDA-NRCS. *Estimating Runoff and Peak Discharges, Engineering Field Handbook*, Chapter 2. August 1987.
5. USDA-NRCS, *Urban Hydrology for Small Watersheds*, Technical Release 55. June 1986.
6. USDA, NRCS, *Field Office Technical Guide*, Section IV.
7. USDA-NRCS, Geology. *National Engineering Manual*, Part 531.21, September 1999.
7. Geology, USDA-NRCS, Geology. *National Engineering Handbook*, Part 531, Section 8, Chapter 1, 1978.